Engineering Review

A Remote Control Pumping Station

There is a town in Arizona which has for years been shipping in all its water by railroad tank cars, despite the fact that it is situated on the banks of a rushing, foaming river. The trouble is that those banks are nearly a mile high—the river is the Colorado, and the town is located on the rim of the Grand Canyon. But now those tank cars which have been hauling an average of 70,000 gallons each day can go elsewhere, for electric pumps are being installed under supervisory control by which all the behavior of the machinery far below will be evident from the control point above. Control wires are buried under ground so as not to deface the scenery.

Water pumped 3000 feet high is a precious commodity, to say nothing of its value when it has been hauled into that same town by tank car. Packed with energy, an ordinary bucketful emptied into the canyon could generate a horsepower for nearly a minute or so if it had a waterwheel at the bottom. More than six horsepower are required to supply a single faucet in the town.

The unsatisfactory and expensive importation of water has been eliminated by the installation of a remotely controlled pumping station 3000 feet below the rim of the canyon. Four vertical turbine-type pumps, each driven by a 60 h. p. squirrel-cage induction motor operating at 3600 r. p. m. are used. Each pump is good for a vertical lift of 1700 feet, two pumps running in series. Thus each complete unit consists of two pumps and two motors, totaling 120 h. p. Two such units have already been installed, with provision made for a third unit. They are located 3153 feet in vertical distance below the top of the tanks on the canyon rim, with a total pipe length of 12,000 feet. Each unit can handle 85 gallons per minute against a head of 3400 feet.

The isolated and inaccessible location of the pumping station—it can be reached only by a narrow trail down the cliff—together with the nature of the station made it impractical to keep an operator on duty to run it. By means of a visicode supervisory control the station is normally unattended, being completely operated by a man in the power house on the canyon rim.

This operator can start, stop, and receive indications of each pumping unit; the motors are equipped with automatic starting switches arranged to limit the starting current to 14% of the running current. The contacts for starting and stopping, operated by pushbuttons in manual stations, are operated by the supervisory control. An interlock on the starting compensation operates when the motor is connected to a full-line voltage to control the supervisory lamp signals.

He can open or close the drain valve by means of a motor-driven valve hook-up. This valve is operated independently of the other control.

He can receive indications of low water in the reservoir, and act accordingly. Four float switches are installed in the reservoir at the pumping station—one for each unit, one for automatic control of the auxiliary pumps, and one for supervisory signal purposes.

He can receive indications of dangerously low temperatures. Part of the upper section of the pipe line is exposed, and at times the temperature goes down to 20°F. A thermostat has been installed at the coldest point along the line, which rings a bell and flashes lamp signals in the control station when danger from freezing threatens. In such a case the operator can either drain the line or operate the pumps to maintain a flow of water.

And lastly, he can connect telephone communication between the pumping station and the power house, to facilitate periodic maintenance and inspection. The telephones are incorporated with the supervisory control, and operate over the same wires as the control.

Equipment of this sort opens a new era for pumping stations of all kinds—for oil, gas, gasoline, or in short, for any extended pumping service. The pumps themselves can be located at the most advantageous point in the line, and can be controlled from any convenient point.

—*Westinghouse Technical Press.*

Airplane Ventilation System

The new systems installed in the Stinson airplanes used on the American Airways lines between Boston and New York illustrate the progress in the heating and ventilation of airplanes. Three separate units of the system are: heating the air, cooling the air, and exhausting the foul and hot air.

Fresh air is taken in at the edge of the lower wing and passed over a chamber where it is heated by the exhaust. Having been heated it is carried to outlets at each individual passenger seat. The pilot may regulate the supply of heat and the passenger may regulate the heat that is coming to his seat. The heater from the central motor is used to heat the pilot's cabin.

The cool air system in these planes is installed in the leading edge of the wing and the air is conveyed to the passengers through individual vents which may be also regulated by the passengers. In addition the entire system may be regulated by the pilot.

The exhaust unit is located in the ceiling of the cabin. It is entirely under the control of the pilot who has an indicator on his instrument board telling him the condition of the air in the cabin. The foul and hot air is sucked through a specially designed venturi.

Cool air enters just behind and above the passenger's head and settles to the floor. In this way a constant circulation is maintained. By using a number of small holes instead of one large one for the air to enter through, drafts and blasts of air have been eliminated.

—*Aero Digest.*

Automatic Kiln

Although the trade-mark of the potter's art, the potter's wheel has been unchanged over a period of 3,000 years, the other processes of the industry have been very noticeably advanced from year to year.

During the past few years a great step in the advancement of the industry has taken place with the introduction of the automatic gas fired kiln. Sun baking was first used in hardening the pottery. Burning by fire was the next step which led to the use of crude furnaces, the upright and muffle periodic kilns and finally to the modern mechanical kiln.

A new type of combination down-draft kiln was perfected a few years ago by the Mayer China Company. They developed a kiln for the burning of glost-ware, a type of pottery that has been fired, glazed, and refired. The kiln consists of a long brick tunnel with fire boxes on each side with a gas burner in each which fires directly into the kiln. There is a track through the kiln and a parallel one outside with a transfer track at each end. The ware is gradually heated to maturity as it passes through the kiln and is slowly cooled before it reaches the discharge end.

A complete system of temperature control is utilized. Thermo-couples are distributed throughout the kiln and these are connected to a multipoint switch and recording pyrometer on the control board.

—*Scientific American.*

Control for Radio Stations

The Department of Commerce states that there soon will be radio beacons and radio communication stations at about seventy different locations using remote control. The radio operators will be stationed at airports using telephone circuits to make broadcasts and controlling equipment. Teletypewriter equipment for the dispatch and receipt of weather conditions will be housed at the central stations.

Better coordination with air transport operators and fliers will be secured, and weather information will be available promptly, while weather maps will be obtainable immediately through the location of the control station at the airport. This centralized control will reduce operation costs and promote efficiency.

The standard equipment will include machine-switching apparatus, monitoring system, radio receiver, speech input equipment, high-frequency receiver, batteries, line equalizers, and charging equipment. Mounted on standard racks, this equipment will be enclosed within a soundproof cabinet. At least one machine for the reception of weather messages on the teletypewriter circuit and a page type machine and duplicating apparatus for making copies of weather maps also are to be located at the station.

The remote-control device will consist of a machine switch, secondary relays, a control transmitter and an amplifier.

Eighteen operations will be able to be carried on by dialing two digits. The machine-switch apparatus will have a capacity of 100 functions.

—*Aero Digest.*

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One-piece Motor and Boring Mill

Big direct-current electrical machines must *not* have the slightest irregularity in their commutators, so the first boring mill ever to be developed with the motor and spindle in one piece was recently brought forth. The armature of the motor is mounted directly on the spindle of the table. The purpose of this construction was chiefly to eliminate the tiny irregularities in the finish of large commutators and similar work which had been traced back to the gears of the conventional boring mill. The motor is of slow speed and is comparatively large for its power; however, it does away with all gearing and speed-changing devices. This motor's ratings vary from 33 h.p. at 28 r.p.m. to 106 h.p. at 92 r.p.m. It can be operated as slowly as 4 r.p.m.; the extraordinary speed range is obtained through the use of adjustable voltage supply The weight of the shaft and armature is supported on a Kingsbury thrust bearing; it is equipped with a force-feed lubrication system.

—*Westinghouse Technical Press.*

Young Man: "May I have this dance?"

Young Lady: "No, I am sorry, but I am too danced out."

Young man (slightly deaf)—"Oh, no, you're not, madam, you're just pleasingly plump."

He: "I've never seen such dreamy eyes."

She: "You've never stayed so late before."

Wrecked Motorist (opening his eyes): "I had the right of way, didn't I?"

Bystander: "Yeh, but the other fellow had a truck."